

REMARKS/ARGUMENTS

Claims 1-35 and new claims 36-39 are pending in the application, with claims 11-30 and 35 being withdrawn pursuant to a restriction requirement. Reconsideration and a withdrawal of all outstanding objections and rejections are hereby respectfully requested in view of the above amendments and the following remarks.

Applicant acknowledges the election of species of the group 1 claims 1-10 and 31-34.

New claims 36-39 have been added to recite halogenated monomeric phenazinium compounds, a method of preparing them, and an acidic bath. Claims 1-35 have been amended (including through their dependencies) to refer to pseudohalogenated monomeric phenazinium compounds.

1. The Specification and Title are Amended

Applicant has reviewed the Examiner's comments on pages 3-4 of the Office Action and has submitted a substitute specification herewith to address the Examiner's comments. The application specification includes the suggested headings appropriate to the disclosure.

In addition, Applicant has amended the title to read as follows:

**-- ACIDIC BATH CONTAINING SUBSTITUTED HALOGENATED OR
PSEUDOHALOGENATED MONOMERIC PHENAZINIUM COMPOUNDS FOR
ELECTROLYTICALLY DEPOSITING A COPPER DEPOSIT ONTO A WORKPIECE--**

Accordingly reconsideration and a withdrawal of the objection is respectfully requested in view of the amendment to the title.

2. The Claim Objections Have Been Addressed

Claim 1 stands objected to because the Examiner believes that the term general should be omitted in line 3. Applicant has amended claim 1 to remove the reference to this term.

In addition, the Examiner has indicated that "carbonic acid ester" should be replaced with --carboxylate ester--. Applicant has amended claim 1, and accordingly, the objection is believed moot in view of the amendment.

In addition, the specification has been amended to recite --carboxylate ester--. As the specification had listed the chemical symbol for this substituent, the amendment is fully supported and no new matter has been introduced.

The Examiner suggested that "sulfoester" should be replaced with --sulfonate ester--. Applicant has amended claim 1, and accordingly, the objection is believed moot in view of the amendment.

In addition, the specification has been amended to recite --sulfonate ester--. As the specification had listed the chemical symbol for this substituent, the amendment is fully supported and no new matter has been introduced.

For these reasons the rejection to claim 1 is now believed to be obviated.

Claim 7 stands objected to because the word "comprising" should be replaced with --consisting of--. Applicant has amended claim 7 accordingly.

In addition the Examiner has requested that claim 7 be set forth with a separate line indentation. Applicant has presented claim 7 to meet this suggestion.

For these reasons, the objection to claim 7 should be withdrawn.

Claim 9 stands objected to because the Examiner is requiring indentation of the separate elements. Applicant has presented claim 9 in the form suggested by the Examiner.

Accordingly the objection to claim 9 should be withdrawn.

Claim 10 has been objected to as being improper dependent form. Claim 10 has been amended to address the objection so that the claim refers to a method of producing the phenazinium compounds recited in claim 1, and, as such, should be further limiting of the subject matter. For this reason, reconsideration and a withdrawal of the objection is hereby respectfully requested.

Claim 34 has been objected to as being improper dependent form. Claim 34 has been amended to address the objection so that the claim refers to a method of producing the phenazinium compounds recited in claim 5, and, as such, should be further limiting of the subject matter. For this reason, reconsideration and a withdrawal of the objection is hereby respectfully requested.

3. The Section 112 Rejection, First Paragraph

Claims 1-6, 10, 33 and 34 stand rejected under 35 U.S.C. 112 first paragraph, as lacking enablement. This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

The Office Action considers that the specification is enabling for substituted phenazinium salts of formula I where independently $R^{1,2,4,6,7,7'',8,9} \neq$ -OH, -CN, -SH, -CO₂H, -CO₂R, -SO₃H, -SO₃R or -heteroaryl; and R⁵ is not -heteroaryl. However, the Examiner considers that the specification does not reasonably provide enablement for substituted phenazinium salts of the formula I, where independently $R^{1,2,4,6,7,7'',8,9} =$ -OH, -CN, -SH, -CO₂H, -CO₂R, -SO₃H, -SO₃R or -heteroaryl; and R⁵ is -heteroaryl.

Applicant submits that the specification is not only enabling for the compounds that the Examiner acknowledges that are indeed enabled, but also that the additional compounds are enabled. However, in order to facilitate prosecution of the application, Applicant has amended claim 1 to recite the compounds that the Examiner acknowledges to be enabled. Applicant submits that one of ordinary skill in the art would understand from the specification that all of the compounds are enabled.

Claim 1 now recites substituted phenazinium salts of formula I where R¹, R², R⁴, R⁶, R⁷, R^{7''}, R⁸ and R⁹ are selected independently of each other from a group consisting of hydrogen, halogen, amino, aminoalkyl, hydroxy, cyano, thiocyanate, isothiocyanate, cyanate, isocyanate, lower alkyl, unsubstituted aryl and substituted aryl . . .

Claim 1 further recites that "R⁵ is selected from a group consisting of lower alkyl, unsubstituted aryl and substituted aryl wherein the substituents are selected from the group consisting of alkyl, halogen, hydroxyl, amino, wherein amino is NH₂, NHR or NR'R'', wherein R, R' and R'' are lower alkyl, cyano, thiocyanate and mercapto . . ."

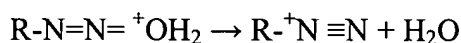
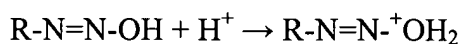
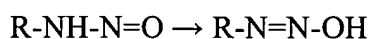
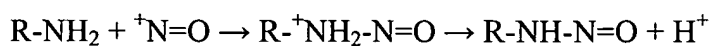
The compounds recited in claim 1 include those that the Examiner has considered to be enabled by the Applicant's specification. However, Applicant also has included the compounds where R^{1,2,4,6,7,7'',8,9} = hydroxy and cyano. Applicant submits that these compounds would be enabled by the Applicant's specification.

Applicant has reviewed the Office Action, and it would appear that there is no dispute between what the Applicant claims and the Examiner's position regarding the enablement of where R^{1,2,4,6,7,7'',8,9} = hydrogen, halogen, amino, aminoalkyl, thiocyanate, isothiocyanate, cyanate, isocyanate, lower alkyl, unsubstituted aryl and substituted aryl and regarding R⁵ = unsubstituted aryl and substituted aryl. The Examiner did not raise any rejections regarding these species.

As to the enablement regarding synthesis of the halogenated and pseudohalogenated phenazinium compounds as claimed with the species for R^{1,2,4,6,7,7'',8,9} and R⁵, for which the Examiner contests enablement, namely for R^{1,2,4,6,7,7'',8,9} = hydroxy, cyano, mercapto, carboxy, the salt thereof, carboxylate ester, sulfo, the salt thereof, sulfonate ester, heteroaryl and alicyclic heteroradicals and for R⁵ = heteroaryl, one needs to consider the mechanism of the synthetic method used according to the invention to manufacture the compounds as claimed. It is demonstrated from this mechanism, that the compounds having the latter species as residues for

$R^{1,2,4,6,7,7'',8,9}$ and R^5 may be manufactured with the same method as the compounds which have already been shown to be easily synthesizable according to the Preparation Examples of the specification:

The mechanism is the well-known reaction of primary amines with nitrous acid for example:



with R being the phenazinium moiety.

The product received with this diazotation method is a diazonium compound which forms intermediately. It is well-known, that formation of the diazonium cation takes place readily. This intermediate diazonium salt will then spontaneously react with a halogen or pseudohalogen (cyanate, thiocyanate, isocyanate, isothiocyanate) ion present in the reaction mixture to form the claimed phenazinium compound while N_2 is split off from the phenazinium moiety in a SANDMEYER type reaction. As halogen and pseudohalogen ions are used to readily react with the carbenium ion formed when N_2 is split off from the phenazinium moiety no rearrangement reactions or other side reactions will take place. Once the diazonium cation is formed the reaction will further proceed to the halogen or pseudohalogen compounds. The reaction conditions will be almost identical for all these compounds, irrespective of the type of species used for $R^{1,2,4,6,7,7'',8,9}$ and R^5 . In fact, Applicant, at pages 13 and 14 of the specification, refers

to the Sandmeyer reaction and further provides a disclosure of the present invention. Applicant's claimed compositions and methods are enabled by the Applicant's disclosure.

It is for the above reasons, that the reaction products will not depend on the type of residues chosen for $R^{1,2,4,6,7,7'',8,9}$ and R^5 that the reaction conditions will not vary so that undue experimentation will not be required by those skilled in the art. The manufacturing method to yield the phenazinium compounds of the invention has proven to be a standard method which will not be required to be adapted to a greater extent even if the type of residues on the phenazinium ring system varies. Therefore, there is no reason to assess a lack of enablement for the compounds outlined in the Office Action, and in particular those hydroxyl and cyano compounds included in claim 1, as amended.

Accordingly, the 112 rejection, first paragraph, of claims 1-6, 10, 33 and 34 as not being enabled should be withdrawn.

Reconsideration and a withdrawal of the rejection is respectfully requested.

4. The Section 112 Rejection, Second Paragraph

Claims 1, 4-6, 10, 33 and 34 stand rejected under 35 USC 112, second paragraph, as being indefinite. This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

Applicant has reviewed the Examiner's rejection and has amended the claims to more particularly articulate the invention.

As to claim 1, the rejection regarding "the salt thereof in claims 1, 4-6, 10, 33, 34 is moot in view of the amendment deleting -CO₂salt and -SO₃salt.

As to claims 1-7, 10 and 31-34, the rejection regarding the term "an acid anion" in those claims does not render the invention indefinite. However, in order to facilitate prosecution, Applicant has amended claim 1 to recite that the acid anion, A-, is selected from the group consisting of: sulfate, hydrogen sulfate, halide, tetrafluoroborate, hexafluorophosphate, nitrate, acetate, trifluoroacetate and methane sulfonate. This amendment is fully supported by the specification, see page 12, lines 24-26 in WO 2005/049584 A1 (Applicant's specification).

Reconsideration is respectfully requested.

Claims 1, 4-6, 10, 33 and 34 stand rejected under 35 USC 112, second paragraph, as being indefinite. This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

The Office Action considers that the term "substituted" in claims 1, 4-6, 10, 33, 34 is not definite. Applicant has substituted this term with the definition given on page 5, lines 28-32 in WO 2005/049584 A1. Therefore, claim 1 recites that the residues are substituted by alkyl, halogen, hydroxyl, amino, wherein amino is NH₂, NHR or NR'R'', wherein R, R' and R'' are lower alkyl, cyano, thiocyanate and mercapto.

For these reasons, the rejection should be withdrawn.

5. The Section 102 Rejection Over Montono

Claims 1-6, 10 and 31-34 stand rejected under 35 U.S.C. 102 as being anticipated by Motono et al. (JP 60056086). This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

Applicant's invention, as recited in the claims, is not disclosed or suggested by Motono.

Applicant has amended claim 1 to more particularly distinguish the invention. Claim 1 now recites "Pseudohalogenated monomeric phenazinium compounds . . ." and that:

X is a pseudohalogen and A⁻ is an acid anion selected from the group consisting of sulfate, hydrogen sulfate, halide, tetrafluoroborate, hexafluorophosphate, nitrate, acetate, trifluoroacetate and methane sulfonate.

New claim 36 recites "Halogenated monomeric phenazinium compounds . . ." and that:

X is a halogen and A⁻ is an acid anion;
wherein the phenazinium compounds are selected from the group consisting of
i) 3-chloro-7-N N-dimethylamino-2-methyl-5-phenyl-phenazinium salt,
ii) 3-bromo-7-N N-dimethylamino-2-methyl-5-phenyl-phenazinium salt
and iii) 3-bromo-7-N,N,-diethylamino-5-phenyl-phenazinium salt.

The above amendments and new claim are fully supported by the specification, see page 9, lines 21-25 in WO 2005/049584 A1. Claim 36 more particularly articulates the invention and distinguishes the invention over Motono et al.

In addition, Applicant has amended claim 1 to further define the "salt" of the pseudohalogenated compounds in accordance with page 12, lines 24-26 of WO 2005/049584 A1,

as a sulfate, hydrogen sulfate, halide, tetrafluoroborate, hexafluorophosphate, nitrate, acetate, trifluoroacetate and methanesulfonate.

The claimed phenazinium compounds so defined by the claims are novel over Motono et al.

Motono et al. describe the use and production of phenazinium compounds for the deposition of copper from an acidic electroplating bath, wherein the compounds may, *i.e.*, also be halogenated (B = OH or halogen). Motono et al. do further disclose specific halogenated compounds (Compounds 3, 6) and mixtures of compounds which are either halogenated or substituted with hydroxy on the 3-position. Motono et al. do not disclose any one of the halogenated phenazinium compounds. They neither disclose any pseudohalogenated phenazinium compounds (phenazinium compounds substituted in the 3-position with cyanate, thiocyanate, isocyanate, isothiocyanate).

Therefore, the invention as claimed is novel over Motono et al. Accordingly, for these reasons, the section 102 rejection with respect to Motono et al. should be withdrawn.

6. The Section 103 Rejection Over Montono

Claims 1-10 and 31-34 stand rejected under 35 U.S.C. 103(a) as being obvious in view of Motono et al. (JP 60056086). This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

The Examiner considers the phenazinium compounds as claimed as being obvious in view of Motono et al. because Motono et al. disclose phenazinium compound No. 3 (Table 1)

which differs from the above claimed phenazinium compound No. i) in that R² would be -H in the Moton et al. compound whereas it would be -CH₃ according to the present invention.

Further, Moton et al. would disclose that R² could also be -CH₃. Furthermore, case law would recognize that structural similarity between claimed and prior art subject matter, where the prior art gives reason or motivation to make the claimed compositions or compounds, would create a *prima facie* case of obviousness. However, Moton et al. does not provide the reason or motivation to make the claimed compositions.

The patentability over the cited reference is further supported by the governing law:

In *P&G v. Teva Pharms. USA, Inc.*, 566 F.3d 989, 997 (Fed. Cir. 2009), the Federal Circuit, in rejecting an obviousness contention, held that there was no credible evidence that the structural modification was routine. The Federal Circuit reasoned that:

[T]hough, researchers can only "vary all parameters or try each of numerous possible choices until one possibly arrive[s] at a successful result, where the prior art [gives] either no indication of which parameters [are] critical or no direction as to which of many possible choices is likely to be successful." *In re O'Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988). In such cases, "courts should not succumb to hindsight claims of obviousness." *In re Kubin*, 561 F.3d 1351, 1359 (Fed. Cir. 2009). Similarly, patents are not barred just because it was obvious "to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it." *In re O'Farrell*, 853 F.2d at 903.

Teva Pharms., 566 F.3d at 997.

See also *In re Gyurik*, 596 F.2d 1012, 1018 (C.C.P.A. 1979) ("An element in determining obviousness of a new chemical compound **is the motivation of one having ordinary skill in the art to make it**. That motivation is not abstract, but practical, and is always related to the properties or uses one skilled in the art would expect the compound to have, if made. *In re Stemniski*, *supra* note 10, at 1416-17, 444 F.2d at 585-86, 170 USPQ at 347 (1971). The present obviousness rejection cannot stand without some basis in the expected properties of the claimed

compounds.”)

Moreover, first, it is to be questioned whether the Motono et al. abstract indeed discloses $R^2 = -CH_3$. The abstract available (from Patent Abstract of Japan) discloses $R^Z =$ lower alkyl and not $-CH_3$. This is less specific than $-CH_3$.

As to the three specimens of halogenated phenazinium compounds as claimed (see claim 36), Motono et al. do not suggest any one of just these three compounds to achieve the above targets. In the case of the compound of Motono et al. having $R^2 = -H$ and the compound of the invention compared to this one with $R^2 = -CH_3$, those skilled in the art would have a great number of alternatives for permutation to arrive at the claimed compound when the compound of Motono et al. is used to start with:

Motono et al.	Present Invention
$R_3 = H$, lower alkyl, substituted aryl	$R^2 = -CH_3$
$B =$ halogen, OH	$X =$ chloro
$R_2 = H$, lower alkyl, substituted (?) aryl	$R^5 =$ phenyl
$A =$ alkyl-substituted amino	$NR^7R^{7'} = N(CH_3)_2$
$R_1 = H$, lower alkyl, substituted aryl	$R^7 =$ hydrogen

Thus, it is not only the difference between the substituents of R^2 .

In addition, contrary to the allegation of the Examiner, that structural similarity would give a *prima facie* case of obviousness, as the law cited above provides, structural similarity does not create such *prima facie* of obviousness. This is true here because there is no real relationship

between the structure of a compound used in this art and the properties it has in the baths used in this art. To date it is still unpredictable to achieve a desired effect in electroplating if only the structure of a compound used as an additive is known.

After all, the Applicant considers the phenazinium compounds as being non-obvious over Motono et al.:

The problem to be solved by the present invention is to find additives for an acidic copper electroplating bath by means of which particularly uniform and brilliant, meaning high polish, as well as leveled and ductile copper coatings may be reproducibly prepared. The additives are hereby intended to be readily synthesizable at a low cost while remaining unchanged in quality and exhibiting high purity. It further intends to enable production of high polish, leveled and ductile copper layers using a relatively high cathodic current density. The composition of such a copper plating bath is intended to constantly permit, during bath operation over a long period of time, to obtain copper layers having the required quality.

The problem is solved using the claimed phenazinium compounds. Therefore, the halogenated phenazinium compounds are considered to be non-obvious in view of Motono et al. Further as mentioned, Motono et al. do neither disclose nor suggest pseudohalogenated phenazinium compounds. Hence this group of compounds is also non-obvious in view of Motono et al.

7. The Double Patenting Rejection

The Examiner has rejected the claims based on obviousness-type double patenting. Claims 1-10 and 31-34 stand rejected over claim 11 of copending Application No. 10/538,286. Applicant points out that claim 11 of the copending application does not disclose monomeric phenazinium compounds but simply fractions of oligomeric phenazinium compounds, wherein a couple of such fractions give one oligomeric phenazinium compound. Such property of the fractions given in this claim may be readily apparent from the fact that the moieties given therein are written as radicals: They are written with the suffix "ium" which indicates that these moieties are simply fractions of the compounds disclosed in this application. The meaning of these moieties is even more clear from the fact that they are termed "monomeric units" in this claim and that these "monomeric units" are those "monomeric units" according to claim 11 which make up oligomeric compounds. It is for this reason that the monomeric phenazinium compounds of the present application are different than the oligomeric phenazinium compounds of the copending application. Furthermore, the copending application is directed to claiming a mixture of at least two such oligomeric phenazinium compounds. Therefore, the difference between the subject matter of the present application and that of the copending application is even more pronounced.

For these reasons, the oligomeric compounds and the mixture of the compounds of the copending application and the monomeric phenazinium compounds as claimed are not obvious to each other since they are clearly distinct from each other.

Response to Office Action dated July 7, 2009
Serial No. 10/575,304
Response dated: November 9, 2009

B-7228

For these reasons, Applicant respectfully traverses the terminal disclaimer requirement and the double patenting rejection.

CONCLUSION

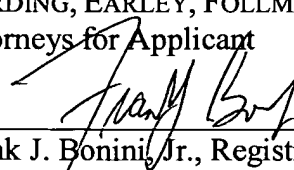
Accordingly, for the above reasons, reconsideration and a withdrawal of all outstanding objections and rejections are hereby respectfully requested.

Early action on the case and examination of the pending claims is hereby earnestly solicited.

In the event that an extension of time, or further extension of time, is necessary, in order for this response to be timely filed, Applicant hereby respectfully requests the necessary extension.

The Commissioner is authorized to charge any additional fees, including extension fees, which may be required to Patent Office Deposit Account No. 05-0208.

Respectfully submitted,
Frank J. Bonini, Jr.
HARDING, EARLEY, FOLLMER & FRAILEY
Attorneys for Applicant


Frank J. Bonini, Jr., Registration No. 35,452
86 The Commons at Valley Forge East
1288 Valley Forge Road
P. O. Box 750
Valley Forge, PA 19482-0750
Telephone: 610-935-2300
Fax: 610-935-0600

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